

Jeongbin Seo, Ph.D.

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🌐 <https://jeongbin.github.io/>

Employment History

- 2024.10 - - - - - █ **Chick Keller Fellow**, Los Alamos National Laboratory, Theoretical Division
Advisor: Dr. Fan Guo, Dr. Hui Li
- 2023.12 - - 2024.9 █ **Postdoctoral Researcher**, Los Alamos National Laboratory, Theoretical Division
Advisor: Dr. Fan Guo, Dr. Hui Li
- 2022.9 - - 2023.11 █ **Postdoctoral Researcher**, Department of Physics, Ulsan National Institute of Science & Technology.
Advisor: Prof. Dongsu Ryu

Education

- 2018.09 - - 2022.08 █ **Ph.D., Pusan National University** Earth Science.
Advisor: Prof. Hyesung Kang
Degree date: 08/26/2022
Thesis title: *A Simulation Study of Ultra-relativistic Jets.*
- 2015.03 - - 2018.02 █ **M.Sc., Pusan National University** Earth Science.
Advisor: Prof. Hyesung Kang
Degree date: 02/23/2018
Thesis title: *The Contribution of Stellar Winds to Cosmic Ray Production.*
- 2008.03 - - 2012.02 █ **B.Ed., Pusan National University** Earth Science Education.
Degree date: 02/17/2012

Awards and Fellowships

- 2024 █ **LANL SPOT Award**, Los Alamos National Laboratory
- 2024-2027 █ **Chick Keller Fellow**, Los Alamos National Laboratory
- 2021 █ **Busan Future Scientist Award**, Federation of Busan Science and Technology
- 2020-2022 █ **NRF Ph.D. Fellow**, The National Research Foundation of Korea

Research Publications

First-Author Papers

- 1 **J. Seo**, F. Guo, X. Li, B. Chen, C. Shen, and H. Li, “Energetic nonthermal electrons within the above-the-looptop regions in solar flares: Acceleration, feedback, and quasiperiodic pulsations,” *The Astrophysical Journal*, vol. 997, no. 2, p. 313, Jan. 2026. DOI: 10.3847/1538-4357/ae2de6.
- 2 **J. Seo**, D. Ryu, and H. Kang, “Energy spectrum and mass composition of ultra-high-energy cosmic rays originating from relativistic jets of nearby radio galaxies,” *The Astrophysical Journal*, vol. 988, no. 2, p. 194, Jul. 2025. DOI: 10.3847/1538-4357/ade678.
- 3 **J. Seo**, F. Guo, X. Li, and H. Li, “Proton acceleration in low- β magnetic reconnection with energetic particle feedback,” *The Astrophysical Journal*, vol. 977, no. 2, p. 146, Dec. 2024. DOI: 10.3847/1538-4357/ad8e64.

- 4 J. Seo, H. Kang, and D. Ryu, "Model spectrum of ultrahigh-energy cosmic rays accelerated in fr-i radio galaxy jets," *The Astrophysical Journal*, vol. 962, no. 1, p. 46, Feb. 2024. DOI: 10.3847/1538-4357/ad182c.
- 5 J. Seo, H. Kang, and D. Ryu, "A new code for relativistic hydrodynamics and its application to fr ii radio jets," *IAU Symposium*, vol. 362, pp. 87–93, Jan. 2023. DOI: 10.1017/S1743921322001314.
- 6 J. Seo and D. Ryu, "How-mhd: A high-order weno-based magnetohydrodynamic code with a high-order constrained transport algorithm for astrophysical applications," *Astrophysical Journal*, vol. 953, no. 1, 39, p. 39, Aug. 2023. DOI: 10.3847/1538-4357/acdf4b.
- 7 J. Seo, D. Ryu, and H. Kang, "A simulation study of ultra-relativistic jets. iii. particle acceleration in fr-ii jets," *Astrophysical Journal*, vol. 944, no. 2, 199, p. 199, Feb. 2023. DOI: 10.3847/1538-4357/acb3ba.
- 8 J. Seo, H. Kang, and D. Ryu, "A simulation study of ultra-relativistic jets. ii. structures and dynamics of fr-ii jets," *Astrophysical Journal*, vol. 920, no. 2, 144, p. 144, Oct. 2021. DOI: 10.3847/1538-4357/ac19b4.
- 9 J. Seo, H. Kang, D. Ryu, S. Ha, and I. Chattopadhyay, "A simulation study of ultra-relativistic jets-i. a new code for relativistic hydrodynamics," *Astrophysical Journal*, vol. 920, no. 2, 143, p. 143, Oct. 2021. DOI: 10.3847/1538-4357/ac19b3.
- 10 J. Seo, H. Kang, and D. Ryu, "The contribution of stellar winds to cosmic ray production," *Journal of Korean Astronomical Society*, vol. 51, no. 2, pp. 37–48, Apr. 2018. DOI: 10.5303/JKAS.2018.51.2.37.

Co-Authored Papers

- 1 F. Guo, O. French, Q. Zhang, X. Li, and J. Seo, "Particle injection problem in magnetic reconnection and turbulence," *Space Science Reviews*, vol. 221, no. 103, 2025. DOI: 10.1007/s11214-025-01226-x.
- 2 H. Kang, D. Ryu, and J. Seo, "Simulation Study of Binary Mergers of Galaxy Clusters I: Properties of Merger Shocks and Radio Emission," *arXiv e-prints*, arXiv:2512.07214, arXiv:2512.07214, Dec. 2025. arXiv: 2512.07214 [astro-ph.HE].
- 3 X. Li, C. Shen, X. Xie, F. Guo, B. Chen, I. Oparin, Y. Wei, S. Yu, and J. Seo, "Energy conversion and electron acceleration and transport in 3d simulations of solar flares," *The Astrophysical Journal*, vol. 991, no. 2, p. 202, Sep. 2025. DOI: 10.3847/1538-4357/adfcfd5.
- 4 A. Bhattacharjee, J. Seo, D. Ryu, and H. Kang, "A simulation study of low-power relativistic jets: Flow dynamics and radio morphology of fr-i jets," *The Astrophysical Journal*, vol. 976, no. 1, p. 91, Nov. 2024. DOI: 10.3847/1538-4357/ad83cc.

Conferences

Invited Talks, Seminars, and Colloquia

- 2025.07  "A New Computational Method for Energetic Particle Acceleration and Transport with Feedback: Applications to Magnetic Reconnection and Turbulence."
Midwest Magnetic Fields Workshop 2025, Madison, WI.
- 2025.04  "Efficient Acceleration and Feedback of Non-Thermal Electrons in Solar Flares."
HSR Team+ Workshop 2025: Energy Release and Conversion in Solar Eruptive Events, NJIT, Newark, NJ.
- 2024.10  "A New Code for Relativistic Hydrodynamics and Its Application."
Geophysical and Astrophysical Fluid Dynamics (GAFD) Seminar Series, UC Santa Cruz, Santa Cruz, CA.
- 2024.04  "Acceleration of Non-Thermal Electrons in Solar Flares."
CfA Solar Science Meeting, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.

Conferences (continued)

- “Radio Galaxy Jets as the Origin of Ultra-High-Energy Cosmic Rays.”
CfA High Energy Seminar, Harvard–Smithsonian Center for Astrophysics, Cambridge, MA.
- “Radio Galaxy Jets as the Origin of Ultra-High-Energy Cosmic Rays.”
CfA Galaxy Cluster Group Meeting, Harvard–Smithsonian Center for Astrophysics, Cambridge, MA.
- 2024.03 ■ “Particle Acceleration in Astrophysical Phenomena.”
LANL Plasma Group Seminar, Los Alamos National Laboratory, Los Alamos, NM.
- 2023.11 ■ “Radio Galaxies as the Origin of Ultra-High-Energy Cosmic Rays.”
71st GWNR Workshop, Daejeon, South Korea.
- 2023.03 ■ “Acceleration of Ultra-High-Energy Cosmic Rays at Radio Galaxy Jets.”
The VLBI Group Seminar, Max-Planck Institute, (Online), Germany.
- 2023.01 ■ “A Simulation Study of Radio Galaxy Jets.”
2023 SKA-Korea Workshop, Cheonan, South Korea.
- 2022.09 ■ “Introduction to Relativistic Hydrodynamics Simulations and Their Applications.”
66th GWNR Workshop, Pohang, South Korea.
- 2021.12 ■ “FR-II Radio Jets and the Acceleration of UHECRs.”
Korea Young Astronomers Meeting Colloquium, (Online), South Korea.

International Conferences

- 2025.12 ■ “A New Global Heliosphere Model with Pickup Ion and ENA Production and Transport.”
AGU Fall Meeting 2024, New Orleans, LA, Poster.
- “Energetic Particle Acceleration in Magnetic Reconnection: Feedback and Plasma Beta Dependence.”
AGU Fall Meeting 2024, New Orleans, LA, Poster.
- 2025.06 ■ “Efficient Acceleration and Feedback of Non-Thermal Electrons in Solar Flares.”
SHINE Workshop, Charleston, SC, Poster.
- 2024.12 ■ “Acceleration and Transport of Nonthermal Electrons in the Solar Flare Region.”
AGU Fall Meeting 2024, Washington, DC, Poster.
- “Particle Acceleration in Magnetic Reconnection with Feedback from Energetic Particles.”
AGU Fall Meeting 2024, Washington, DC, Talk.
- 2024.08 ■ “Efficient Electron Acceleration in the Solar Flare Region.”
SHINE Workshop, Juneau, AK, Poster.
- 2024.07 ■ “Acceleration of Non-Thermal Electrons in Solar Flares.”
HINODE-17/IRIS-15/SPHERE-3 Joint Meeting, Bozeman, MT, Talk.
- 2023.07 ■ “Generation of Ultra-High-Energy Cosmic Rays at Radio Galaxy Jets.”
ICGAC15, Gyeongju, South Korea, Talk.
- 2023.06 ■ “A New WENO Magnetohydrodynamic Code with a High-Order Constrained Transport Scheme.”
2023 ASTRONUM, Pasadena, CA, Poster.
- 2022.09 ■ “Particle Acceleration at Relativistic Jets of FR-II Radio Galaxies.”
2022 IAUGA, Busan, South Korea, Poster.
- 2022.06 ■ “Relativistic Hydrodynamic Simulations of Ultra-Relativistic Jets in the Intracluster Medium.”
2022 EAS, Valencia, Spain, Poster.
- 2021.11 ■ “A New Code for Relativistic Hydrodynamics and Its Application to FR-II Radio Jets.”
IAU Symposium 362: Computational Astrophysics, (Online), Talk.

Conferences (continued)

Domestic Conferences

- 2023.10 “Radio Galaxies as the Origin of Ultra-High-Energy Cosmic Rays.”
2023 108th KAS Fall Meeting, Jeju, South Korea, Talk.
- 2023.04 “A New Magnetohydrodynamic Code with a High-Order Constrained Transport Scheme.”
2023 107th KAS Spring Meeting, Jeonju, South Korea, Talk.
- 2022.12 “Particle Acceleration in Radio Galaxy Jets.”
6th CHEA Workshop, Cheonan, South Korea.
- 2022.04 “Acceleration of Ultra-High-Energy Cosmic Rays at Relativistic Jets.”
2022 105th KAS Spring Meeting, Busan, South Korea, Talk.
- 2021.11 “FR-II Radio Jets and the Acceleration of UHECRs.”
5th CHEA Workshop, Busan, South Korea.
- 2021.10 “FR-II Radio Jets and the Acceleration of UHECRs.”
2021 104th KAS Fall Meeting, Jeju, South Korea, Talk.
- 2021.04 “Structures and Energetics of Flows in Ultra-Relativistic Jets.”
2021 103rd KAS Spring Meeting, (Online), South Korea, Talk.
- 2020.10 “A New Code for Relativistic Hydrodynamics.”
2020 102nd KAS Fall Meeting, (Online), South Korea, Poster.
- “Morphology and Dynamical Properties of Ultra-Relativistic Jets.”
2020 102nd KAS Fall Meeting, (Online), South Korea, Talk.
- 2020.01 “A Simulation Study of Ultra-Relativistic Jets.”
4th CHEA Workshop, Busan, South Korea.
- 2019.01 “The Contribution of Stellar Winds to Cosmic Ray Production.”
3rd CHEA Workshop, Gyeongju, South Korea.

Collaboration

- 2019 - - - - - **Center for High Energy Astrophysics (CHEA)**
Ulsan National Institute of Science & Technology, South Korea
- 2022 - - - - - **Wombat User Group**
University of Minnesota, USA

Skills

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| Languages | English, Korean |
| Coding | Fortran, Python, C++, IDL, L ^A T _E X, OpenMP, MPI |
| Research | Particle acceleration, Relativistic Jets, Magnetic Reconnection, Collisionless Shock, Astrophysical Turbulence, Galaxy Cluster, Solar Flare, Heliosphere, Hydrodynamics (HD), Relativistic Hydrodynamics (RHD), Magneto-Hydrodynamics (MHD), Monte-Carlo simulation, Simulation code development |

High Performance Computing

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| 5M CPU Times | LANL HPC, MHD, Particle acceleration Simulations |
| 3M CPU Times | NERSC, MHD, Particle acceleration Simulations |
| 4M CPU Times | CHEA Cluster, MHD, RHD, Monte-Carlo Simulations |

High Performance Computing (continued)

- 2M CPU Times  UNIST Supercomputing Center, RHD Simulations
1M CPU Times  PNU Cluster, HD, RHD, Monte-Carlo Simulations

Public Outreach

- 2023.08  “Astronomical Observation: Theory and Practice.”
Physics Festival for High School Students, Ulsan, South Korea.
- 2023.07  “Relativistic Hydrodynamics and Simulating Ultra-Relativistic Jets.”
Numerical Relativity and Gravitational Wave Summer School, Daejeon, South Korea.
- 2023.05  “Becoming an Astrophysicist: Career Pathways.”
Gaeun Middle School, Yangsan, South Korea.
-  “Becoming an Astrophysicist: Career Pathways.”
Muryong High School, Ulsan, South Korea.
- 2023.01  “Numerical Methods for Solving Partial Differential Equations.”
Numerical Relativity and Gravitational Wave Winter School, Ulsan, South Korea.
- 2022.11  “From Science Teacher to Astrophysicist.”
PNU Future Education Center, Busan, South Korea.
- 2022.10  “Inside the Work of an Astrophysicist.”
Gaeun Middle School, Yangsan, South Korea.
- 2022.07  “Career Mentoring: Exploring Astrophysics.”
PNU Future Education Center, Busan, South Korea.
- 2021.12  “How Coding Powers Astrophysics.”
Mulgeum High School, Yangsan, South Korea.
- 2021.11  “Inside the Work of an Astrophysicist.”
Muryong High School, Ulsan, South Korea.

Academic services

- 2024.10 - - - - -  **Journal Reviewer**
Astrophysical Journal
- 2024.02 - - - - -  **Workshop Organizer**
LANL Plasma Group Meeting
- 2023.03 - - 2024.04  **Workshop Organizer**
68th-72nd Workshop on Gravitational Waves and Numerical Relativity
- 2023.05 - - 2023.11  **Workshop Organizer**
2023 Korea Numerical Astrophysics Group Workshop

Teaching Experience

2024.02 - - - - -

Undergraduate & Postbac Mentor

Los Alamos National Laboratory (LANL), NM, United States

- Supervised three student researchers (Purdue University, UC Santa Cruz, University of Utah) through the LANL internship program on topics of magnetic reconnection, relativistic hydrodynamics, and heliospheric modeling.
- Organized weekly intern workshops to enhance presentation and scientific communication skills.

2020.03 - - 2022.08

Teaching Assistant

Pusan National University, South Korea

2012.03 - - 2019.08

High/Middle School Science Teacher

Gyeongsangnam-do Office of Education, South Korea